

WHAT IS CLAIMED IS:

1. An ink jet printing apparatus capable of performing a preliminary ejecting operation that does not contribute to printing, said apparatus comprising:

a print head having a nozzle wherein an amount of ink ejected through said nozzle varies depending on time during which printing is not executed, and in that:

said preliminary ejecting operation is performed taking an opportunity in which an amount of ink passing through said nozzle is decreased below a normal value.

2. The ink jet printing apparatus according to claim 1 wherein said opportunity corresponds to an ejecting state in which said amount of ink passing through said nozzle decreases below said normal value.

3. The ink jet printing apparatus according to claim 1 wherein said opportunity corresponds to a first ejection or first and second ejections following a last ejection.

4. The ink jet printing apparatus according to claim 1 wherein said opportunity corresponds to an ejection between time when said amount of ink passing through said nozzle starts to decrease below said normal value and time when said amount of ink recovers to said normal value.

5. The ink jet printing apparatus according to claim 1 wherein said preliminary ejecting operation is performed on a print medium.

5 6. The ink jet printing apparatus according to claim 5 wherein said preliminary ejecting operation is performed on said print medium only if dots formed on said print medium may be unnoticeable compared to a printed image, and wherein said preliminary ejecting operation is
10 performed on an object other than said print medium if dots may be noticeable.

15 7. The ink jet printing apparatus according to claim 5 wherein said preliminary ejecting operation is performed on an object other than said print medium if said amount of ink decreases below said normal value before said print medium reaches a printed position relative to said print head.

20 8. The ink jet printing apparatus according to claim 1 wherein said preliminary ejecting operation is performed when a predetermined time has elapsed after a last ejection, said predetermined time including time during which said amount of ink passing through said nozzle is decreased
25 significantly.

9. The ink jet printing apparatus according to claim 8

wherein said predetermined time is determined depending on a temperature condition and a humidity condition of said printing apparatus.

5 10. The ink jet printing apparatus according to claim 8 wherein said print head has a plurality of nozzles, and wherein said predetermined time is determined for each of nozzles.

10 11. The ink jet printing apparatus according to claim 10 wherein said predetermined time for each of said nozzles is corrected using dithering, error diffusions, or random numbers so that a dot pattern formed during said preliminary ejecting operation for said plurality of
15 nozzles is unnoticeable compared to a printed image.

12. The ink jet printing apparatus according to claim 8 further comprising:

20 a table used to determined said predetermined time and ejecting numbers for said preliminary ejecting operation, and

a control device for controlling said predetermined ejecting operation, said control device using said table to perform said predetermined ejecting operation.

25 13. The ink jet printing apparatus according to claim 1 wherein said print head includes an electrothermal

converting element, said print head ejecting ink using thermal energy generated by said electrothermal converting element.

5 14. The ink jet printing apparatus according to claim 1 wherein said print head includes a piezoelectric element, said print head ejecting ink using mechanical energy generated by said piezoelectric element.

10 15. An ink jet printing apparatus capable of executing a printing process using ink containing a pigment as a color material and performing a preliminary ejecting operation that does not contribute to printing, said apparatus comprising:

15 a print head having a nozzle wherein an optical density obtained from a pigment concentration of ink ejected through said nozzle varies depending on time during which printing is not executed, and in that:

20 said preliminary ejecting operation is performed taking an opportunity in which an optical density obtained from a concentration of ink passing through said nozzle is decreased below a normal value.

16. The ink jet printing apparatus according to claim 15 wherein said opportunity corresponds to an ejecting state in which said optical density obtained from said concentration of ink passing through said nozzle is

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decreased below said normal value.

17. The ink jet printing apparatus according to claim 15
wherein said opportunity corresponds to a first ejection
5 or first and second ejections following a last ejection.

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10 18. The ink jet printing apparatus according to claim 15
wherein said opportunity corresponds to an ejection
between time when said optical density obtained from said
pigment concentration of ink passing through said nozzle
starts to decrease below said normal value and time when
said optical density of ink recovers to said normal value.

15 19. The ink jet printing apparatus according to claim 15
wherein said preliminary ejecting operation is performed
on a print medium.

20 20. The ink jet printing apparatus according to claim 19
wherein said preliminary ejecting operation is performed
on said print medium only if dots formed on said print
medium may be unnoticeable compared to a printed image,
and wherein said preliminary ejecting operation is
performed on an object other than said print medium if dots
may be noticeable.

25 21. The ink jet printing apparatus according to claim 19
wherein said preliminary ejecting operation is performed

on an object other than said print medium if said amount of ink decreases below said normal value before said print medium reaches a printed position relative to said print head.

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22. The ink jet printing apparatus according to claim 15 wherein said preliminary ejecting operation is performed when a predetermined time has elapsed after a last ejection, said predetermined time including time during which said optical density obtained from said concentration of ink passing through said nozzle is decreased significantly.

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23. The ink jet printing apparatus according to claim 22 wherein said predetermined time is determined depending on a temperature condition and a humidity condition of said printing apparatus.

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24. The ink jet printing apparatus according to claim 22 wherein said print head has a plurality of nozzles, and wherein said predetermined time is determined for each of said nozzles.

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25. The ink jet printing apparatus according to claim 24 wherein said predetermined time for each of said nozzles is corrected using dithering, error diffusions, or random numbers so that a dot pattern formed during said preliminary ejecting operation for said plurality of

nozzles is unnoticeable compared to a printed image.

26. The ink jet printing apparatus according to claim 22 further comprising:

5 a table used to determined said predetermined time and ejecting numbers for said preliminary ejecting operation, and

10 a control device for controlling said predetermined ejecting operation, said control device using said table to perform said predetermined ejecting operation.

27. The ink jet printing apparatus according to claim 15 wherein said print head includes an electrothermal converting element, said print head ejecting ink using
15 thermal energy generated by said electrothermal converting element.

28. The ink jet printing apparatus according to claim 15 wherein said print head includes a piezoelectric element,
20 said print head ejecting ink using mechanical energy generated by said piezoelectric element.

29. A preliminary ejecting method for an ink jet printing apparatus comprising a print head having a nozzle, said
25 apparatus being capable of performing a preliminary ejecting operation that does not contribute to printing, said method comprising a step of:

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(a) executing said preliminary ejecting operation taking an opportunity in which an amount of ink passing through said nozzle is decreased below a normal value, if said amount of ink varies depending on time during which no printing process is executed.

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30. The preliminary ejecting method according to claim 29 wherein said opportunity corresponds to an ejecting state in which said amount of ink passing through said nozzle decreases below said normal value.

31. The preliminary ejecting method according to claim 29 wherein said opportunity corresponds to a first ejection or first and second ejections following a last ejection.

32. The preliminary ejecting method according to claim 29 wherein said opportunity corresponds to an ejection between time when said amount of ink passing through said nozzle starts to decrease below said normal value and time when said amount of ink recovers to said normal value.

33. The preliminary ejecting method according to claim 29 wherein said preliminary ejecting operation is performed on a print medium.

34. The preliminary ejecting method according to claim 33 wherein said preliminary ejecting operation is

performed on said print medium only if dots formed on said
print medium may be unnoticeable compared to a printed
image, and wherein said preliminary ejecting operation is
performed on an object other than said print medium if dots
5 may be noticeable.

35. The preliminary ejecting method according to claim
33 wherein said preliminary ejecting operation is
performed on an object other than said print medium if said
10 amount of ink decreases below said normal value before said
print medium reaches a printed position relative to said
print head.

36. The preliminary ejecting method according to claim
15 29 wherein said preliminary ejecting operation is
performed when a predetermined time has elapsed after a
last ejection, said predetermined time including time
during which said amount of ink passing through said nozzle
is decreased significantly.

37. The preliminary ejecting method according to claim
20 36 wherein said predetermined time is determined depending
on a temperature condition and a humidity condition of said
printing apparatus.

38. The preliminary ejecting method according to claim
25 36 said print head has a plurality of nozzles, and wherein

said predetermined time is determined for each of nozzles.

39. The preliminary ejecting method according to claim 38 wherein said predetermined time for each of said nozzles is corrected using dithering, error diffusions, or random numbers so that a dot pattern formed during said preliminary ejecting operation for said plurality of nozzles is unnoticeable compared to a printed image.

40. The preliminary ejecting method according to claim 29 wherein said print head includes an electrothermal converting element, said print head ejecting ink using thermal energy generated by said electrothermal converting element.

41. The preliminary ejecting method according to claim 29 wherein said print head includes a piezoelectric element, said print head ejecting ink using mechanical energy generated by said piezoelectric element.

42. A preliminary ejecting method for an ink jet printing apparatus comprising a print head having a nozzle, said apparatus being capable of executing a printing process using ink containing a pigment as a color material, and performing a preliminary ejecting operation that does not contribute to printing, said method comprising a step of: (a) executing said preliminary ejecting operation taking

an opportunity in which an optical density obtained from a concentration of ink passing through said nozzle is decreased below a normal value, if said optical density varies depending on time during which no printing process is executed.

43. The preliminary ejecting method according to claim 42 wherein said opportunity corresponds to an ejecting state in which said optical density obtained from said concentration of ink passing through said nozzle is decreased below said normal value.

44. The preliminary ejecting method according to claim 42 wherein said opportunity corresponds to a first ejection or first and second ejections following a last ejection.

45. The preliminary ejecting method according to claim 42 wherein said opportunity corresponds to an ejection between time when said optical density obtained from said pigment concentration of ink passing through said nozzle starts to decrease below said normal value and time when said optical density recovers to said normal value.

46. The preliminary ejecting method according to claim 42 wherein said preliminary ejecting operation is performed on a print medium.

47. The preliminary ejecting method according to claim 46 wherein said preliminary ejecting operation is performed on said print medium only if dots formed on said print medium may be unnoticeable compared to a printed image, and wherein said preliminary ejecting operation is performed on an object other than said print medium if dots may be noticeable.

48. The preliminary ejecting method according to claim 46 wherein said preliminary ejecting operation is performed on an object other than said print medium if said amount of ink decreases below said normal value before said print medium reaches a printed position relative to said print head.

49. The preliminary ejecting method according to claim 42 wherein said preliminary ejecting operation is performed when a predetermined time has elapsed after a last ejection, said predetermined time including time during which said optical density obtained from said concentration of ink passing through said nozzle is decreased significantly.

50. The preliminary ejecting method according to claim 49 wherein said predetermined time is determined depending on a temperature condition and a humidity condition of said printing apparatus.

51. The preliminary ejecting method according to claim 49 said print head has a plurality of nozzles, and wherein said predetermined time is determined for each of nozzles.

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52. The preliminary ejecting method according to claim 51 wherein said predetermined time for each of said nozzles is corrected using dithering, error diffusions, or random numbers so that a dot pattern formed during said preliminary ejecting operation for said plurality of nozzles is unnoticeable compared to a printed image.

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53. The preliminary ejecting method according to claim 42 wherein said print head includes an electrothermal converting element, said print head ejecting ink using thermal energy generated by said electrothermal converting element.

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54. The preliminary ejecting method according to claim 42 wherein said print head includes a piezoelectric element, said print head ejecting ink using mechanical energy generated by said piezoelectric element.

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